

Applicant: ari Juppi et al.
PCT App. No.: PCT/FI2005/050006

Claim Listing

1–13. (cancelled)

14. (new) An arrangement in a paper or board machine comprising:
a press section equipped with at least one press nip;
a paper or board web having a first side and a second side opposite the first side, the paper or board web extending from the press section through a dryer section, the dryer section further comprising:
a web-supporting web transfer through the dryer section;
a pre-impingement dryer which follows the press section and which is arranged to cause direct blowing of air or other hot gas against the paper or board web positioned immediately before a vertical impingement dryer; and
a first dryer group of dryer cylinders positioned subsequent to the vertical impingement dryer, the first dryer group including a dryer cylinder arranged first.

15. (new) The arrangement of claim 14 wherein the pre-impingement dryer is arranged to dry the first side of the paper or board web and the vertical impingement dryer is set to dry the second side of the paper or board web.

16. (new) The arrangement of claim 15 wherein the pre-impingement dryer has a first impingement length and the vertical impingement dryer has a second impingement length and a total impingement length is defined as the sum of the first and second lengths, and wherein the first length is equal to or less than of 50%, of the total impingement length.

17. (new) The arrangement of claim 16 wherein the first impingement length is 15–35% of the total impingement length.

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18. (new) The arrangement of claim 14 wherein the pre-impingement dryer is straight and has an inclination from the horizontal of 60 degrees or less.

19. (new) The arrangement of claim 14 wherein the press section has a last nip, and associated with said last nip of the press section there is a loop formed by a transfer belt, wherein the pre-impingement dryer is set on the transfer belt.

20. (new) The arrangement of claim 14 wherein the vertical impingement dryer further comprises:

a first impingement dryer;

a second impingement dryer;

a down-extending web transfer defined by two opposed sides which are shorter in a horizontal machine-direction than in a vertical direction; and

wherein the first impingement dryer and the second impingement dryer are arranged opposed to the opposed sides of the web transfer such that both impingement dryers dry the second side of the paper or board web.

21. (new) The arrangement of claim 14 wherein the vertical impingement dryer further comprises:

a fabric loop having an inner side and an outer side; and

a plurality of rolls inside the fabric loop supporting and leading the paper or board web downwardly to form the vertical impingement dryer.

22. (new) The arrangement of claim 14 wherein the vertical impingement dryer defines a center line which deviates at most 35° from a perpendicular.

23. (new) The arrangement of claim 14 wherein the vertical impingement dryer is arranged to dry the second side of the paper or board web, and wherein the dryer cylinder arranged first also is positioned to dry the second side of the paper or board web .

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24. (new) The arrangement of claim 14 wherein the pre-impingement dryer further comprises a steambox.

25. (new) The arrangement of claim 14 wherein the pre-impingement dryer is of the gas-operated type.

26. (new) The arrangement of claim 14 wherein the vertical impingement dryer further comprises a fabric loop that is not common with the first dryer group.

27. (new) The arrangement of claim 14 wherein the vertical impingement dryer further comprises a fabric loop that is common with the first dryer cylinder group, and wherein the first dryer cylinder group has a maximum of three dryer cylinders.

28. (new) The arrangement of claim 14 wherein the vertical impingement dryer further comprises a fabric loop that is common with the first dryer cylinder group having four or more dryer cylinders.

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29. (new) A method of dewatering and drying a paper or board web comprising the steps of:

pressing the paper or board web in a press nip of a pressing section;

following the pressing section, drying a first side of the paper or board web by

blowing air or other hot gas directly on to the first side of the paper or board web in a pre-impingement dryer;

after the pre-impingement dryer, drying the second side of the paper or board web in a vertical impingement dryer by blowing air or other hot gas directly on to the second side of the paper or board web; and

drying the second side of the paper or board web in a group of steam heated dryer cylinders such that the second side of the paper or board web is contacted first with a drying surface of a first dryer cylinder of the group of steam heated dryer cylinders which drying surface is the first of the surfaces of the group of steam heated dryer cylinders to contact the paper or board web.

30. (new) The method of claim 29 wherein the air or other hot gas of the pre-impingement dryer or the vertical impingement dryer has a temperature between 250°C and 700°C.

31. (new) The method of claim 29 wherein the press nip is the last press nip in the press section, and further comprising the step of using a draw difference from said last nip of the press section to the first dryer cylinder below 2.9%.

32. (new) The method of claim 29 wherein the press nip is the last press nip in the press section, and further comprising the step of using a draw difference from said last nip of the press section to the first dryer cylinder below 2.5%.

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33. (new) The method of claim 29 wherein the paper or board web is dried to a content-moisture in the range of 48% to 54% in the vertical impingement dryer, and a fabric loop is employed in the vertical impingement dryer that is not common with the first dryer group.

34. (new) The method of claim 29 wherein the paper or board web is dried to a content-moisture in the range of 52% to 57% in the vertical impingement dryer and a fabric loop is employed in the vertical impingement dryer which is common with the first dryer group.

35. (new) The method of claim 29 wherein the paper or board web is dried to a content-moisture in the range of 56% to 65% in the vertical impingement dryer and a fabric loop is employed in the vertical impingement dryer which is common with the first dryer group which has at least four dryer cylinders about which the fabric loop is wrapped.

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36. (new) A method of improving runnability and allowing for shortened dryer section of a paper machine comprising the steps of:

after pressing a paper or board web in a press nip of a pressing section, drying a first side of the paper or board web by blowing air or other hot gas of a temperature of 250°C-700°C directly on to the first side of the paper or board web in a pre-impingement dryer in which impingement takes place directly against the paper or board web and not through a fabric;

within a maximum distance of 4 meters of the pre-impingement dryer, drying the second side of the paper or board web in a second impingement dryer with blowing air or other hot gas of a temperature of 250°C–700°C on two sides of a loop formed by a support fabric, wherein the loop is in the vertical direction longer than its machine-directional dimension and is arranged such that the support fabric remains on the side of the paper or board web opposite blowing air;

keeping the paper or board web attached to the support fabric using internal suction devices, which direct a suction effect to the paper web from inside the support fabric;

within a maximum distance of 4 meters of the second impingement dryer, drying the second side of the paper or board web in a group of steam heated dryer cylinders;

contacting the web second side to a drying surface of a first dryer cylinder of the group of steam heated dryer cylinders having a temperature of approximately 80°C , wherein said drying surface is the drying surface of the group of steam heated dryers to first contact the web; and

wherein the paper or board web is heated by the second impingement dryer to a temperature which deviates less than 15°C from the drying surface of a first dryer cylinder of the group of steam heated dryer cylinders.